In the Specification:

Please replace each paragraph starting on the page and line as indicated with the following:

Page 8, line 21:

B1

FIG. 1 is a schematic description of a cross ssection of the human retina, showing that the retina consists of five layers of cells, primary receptors **4**, bipolar cells **8**, amacrine cells **10**, and retinal ganglion cells **12**. Receptors 4 shown here are cone and rod cells together. The rods respond to ligght intensity, rather than color. The mechanism of adaptation to changing intensity modeled by Dahari and Spitzer operates in achromatic retinal cells **12**. The receptive field (RF) **[RF]** of both chromatic and achromatic ganglion cells **12** includes both on-center and off-center receptors **14** of the center RF area, and receptors **16** of the surround RF area. Hereafter, "center" and "surround" may be written as "cen" and "srnd" respectively.

Page 10, line 17:

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There are six (or alternatively eight, including the yellow on- and off-center cells) main groups of retinal ganglion cells **12** involved in color perception, corresponding to the three kinds of cone cells that respond to color analogously to the response of receptors (rod cells) **4** to intensity. An image is first processed in three most common color-coded channels in the retina (L^+M^-, M^+L^- and $S^+(L^+M)^-$) to three activation-level maps of on-center opponent Parvo long-medium-short wavelength (P-LMS) **[P-LMS]** cells through different retinal layers originating in (receptors) cones **4** (FIG. 1). The off-center opponent cell types L^-M^+, M^-L^+ and $S^-(L^+M)^+$ have similar RF structure but with opposite signs. The input to the cones level is the spectral composition of the light reaching the retina, when illumination falls on a surface of the objects and is reflected from it. The field of view is mapped by the three types of cones, L, M and S. The quantum catches of the three cone types, $L_{pigment}$, $M_{pigment}$ and $S_{pigment}$, are typically expressed by an integration of the inner triple product of the

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spectral sensitivity of each pigment type with the reflectance properties and with the spectral and intensity absorption properties of the surface, at any specific location in the image (Wyszeki & Styles). The responses of the three cone-types, L_{cone}, Mcone and S_{cone}, normalized separately to a range of 0-1, are typically expressed by a Naka-Rushton equation as a function of their inputs $L_{pigment}$, $M_{pigment}$ and $S_{pigment}$ (Dahari and Spitzer; Wyszeki & Styles). The input red, green, and blue intensity values are treated as though they are the responses of red, green and blue cone cells. ...

Page ~~12~~, line 7:

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The second stage of the forward transformation deals with the simulation of double-opponent responses that emulate the action of (cortical) "double-opponent" color coded Parvo double opponent LMS (Pdo-LMSs) **[Pdo-LMSs]** cells, and includes an additional remote adaptation. The color-coded double-opponent cells are adapted (corrected) by a remote adaptation in a manner similar to a mechanism based on psychophysical findings, as shown in Singer & D'Zmura, Vision Research, vol. 34, pp. 3111-3126, 1994. Adaptation is also explained (but not in relation to color and do-remote area) in Dahari and Spitzer. Note that "remote" adaptation refers to the effect of regions peripheral to the "classical" RF.

Page ~~13~~, line 16:

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The mathematical simulation of the physiological processes related to color contrast perception proceeds as follows: the spatial response profiles of the two sub-regions of each (on- and off-) ganglion cell RF Parvo response ganglion cells (P-RGC), the "center" and the "surround" regions, are preferably expressed by a Difference of Gaussians (DOG). As in Dahari and Spitzer, the first step of the present invention is the transformation of each input image to an "output function" or "spectral response function" G. For each color (red, green and blue), there is a center spectral response function G_c (also written as Lcen, Mcen and S_{cen}) and a surround spectral response function G_s (also written as L_{srnd}, M_{srnd} and S_{srnd}). Each of the three center response functions G_c is computed by convolving the corresponding color image with a center local spatial Gaussian filter f_c, as shown in equations 2 and 3 of Dahari and Spitzer, thereby producing a center smoothed image whose pixel values

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are the required G_cs. Similarly, each of the three surround response functions G_s is computed by convolving the corresponding color image with an opposite sign surround local spatial Gaussian filter f_s, thereby producing a surround smoothed image whose pixel values are the required G_ss. Typical values of the radii p of the Gaussian filters are 0.5 pixels for the center filter and 0.5-9 pixels for the surround filter.

Page 24, line 1:

B5

In order to perform contrast on real images it is necessary to inversely transform the adapted (corrected) double-opponent responses (at any location in the image) into a perceived color. Several different inverse functions, based on different assumptions, can be used for this purpose in preferred embodiments of the present invention. The calculated perceived color contrast is the color contrast that would stimulate the triplet of Parvo double opponent after adaptation (P_{do-a}) [$\mathbf{P_{do-a}}$] a LMS cells to the same responses, with a uniform non-contrast surface present in their "remote" areas. The rationale that has lead to this definition is the assumption that the visual system interprets color contrast of an object in a way similar to the one described above. The following equations describe the emulation of the three main double-opponent and opponent color-coded cells, but alternatively all these equations can be applied also to the yellow double-opponent and opponent RFs. In general, the steps in the inverse transformation preferably include: using the adapted double-opponent responses to calculate a new value of a double-opponent response ("new do-response"), assigning the new value to the double-opponent center ("new do-center response") thus obtaining a new value of an opponent response ("new opponent response"), and assigning this new opponent response value to get a new opponent center response ,thus returning to eq. 1, which now has "new center" values.

Page 27, line 22:

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Intensity adaptation or contrast adjustment on the achromatic information in a color image is connected to the color contrast adaptation described above, in the sense that it uses a similar physiological basis for the algorithm and a similar sequence of steps, except that in one alternative case ("case 1") the adaptation is performed on the

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center and surround areas of the opponent RFs, and not on the double-opponent RFs as in the color contrast case. Another difference vs the color contrast adaptation is that in the intensity contrast adaptation of case 1, an inverse transformation may not be applied. Intensity adaptation can be applied independently on achromatic images (non-color or black-and-white pictures) or on the intensity domain of color images. For intensity adaptation, the method emulates two types of ganglion cells of the magno pathway, the on-center and off-center medium wavelength opponent (M-opponent) **[M-opponent]** cells. In a preferred embodiment of the intensity adaptation, the remote adaptation is applied to the center sub-region of opponent RFs (or alternatively to the center and surround sub-regions of the opponent RFs), unlike in color contrast, in which remote adaptation is applied to double-opponent RFs. Alternatively, achromatic contrast adjustment can be performed on double-opponent RFs too.

Page 29, line 13:

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where the RF region is preferably circular, f_c is preferably a Gaussian decaying spatial-weight function, analogous to that in eq. 4. The "surround" response, which now represents the surround sub-region of the RF of **[an]** a Magno response ganglion cell (M-RGC) **[M-RGC]**, is defined as

Page 30, line 1:

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where f_s is also a Gaussian spatial-weight function with asign opposite to that of f_c. As in the color contrast case, the total weight of f_c is 1, while the total weight of f_s is 1/(center/surround ratio) (1/CSR) **[1/CS]**. The steps above are repeated for off-center type cells.

Please make the additional following changes, as suggested by the Examiner, in each paragraph starting on the page and line as indicated :

Page 11, line 16:

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The first stage of the forward transformation is performed analogously to the top path of FIG. 1a, taken from **[FIG. 1 of]** Dahari and Spitzer (notwistanding the fact that Dahari and Spitzer's paper does not contain color information), to provide, at each pixel, an opponent red center response (the pixel value of a "response function"), an opponent green center response, and an opponent blue center response. Optionally, a fourth, yellow opponent center response, which is calculated by simply adding the red and green responses, is obtained with the same forward transformation. In what follows, the fourth color (yellow) is optional in all transformations at the level of opponent and double-opponent cells. A similar transformation is used to obtain red, green and blue surround responses. These surround responses are subtracted from the center responses, in emulation of the action of "on-center" and "off-center" retinal ganglion cells, as follows: the green surround response is subtracted from the red center response; the red surround response is subtracted from the green center response; and the red surround response and the green surround response are averaged to form a yellow surround response, which is subtracted from the blue center response. Optionally, the blue surround response is subtracted from the yellow center response.

Page 15, line 5:

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$R^*_{op(l+)}$, $R^*_{op(m+)}$, $R^*_{op(s+)}$ (and optionally a fourth "yellow" $R^*_{op(l+m)+)}$ are each both a spatial and a spectral filtered response, similar to $R_{op(l+)}$, $R_{op(m+)}$, $R_{op(s+)}$ (and optionally the fourth "yellow" $R_{op((l+m)+)}$ but related to different areas than the corresponding R_{op}s. R_{op} and R^*_{op} and similar pairs below are also referred to herein as, respectively, "non-filtered" and "filtered" responses (in spite of the fact that the "non-filtered" values are obtained of course with operations involving filters). The relationship between non-filtered and filtered opponent responses is illustrated schematically in FIG. 4, where an exemplary (non-filtered) on-center opponent response $R_{op}(x_1, y_1)$ is calculated for pixel 62 centered at (x_1, y_1) using eq. 1, i.e. subtracting the value at (x_1, y_1) of a surround response function $G_s(x_1, y_1)$ from a center response function $G_c(x_1, y_1)$. As explained above, both $G_s(x_1, y_1)$ and $G_c(x_1, y_{-1})$ are functions obtained by convolutions involving local filters. A filtered response $R_{op}^*(x_1, y_1)$ to be used in

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eq. 2 for the computation of the do-center responses for the do-cell centered at (x_1, y_1), (and thus associated with $R_{op}(x_1, y_1)$) is calculated in general by applying the local filters in the convolutions yielding G_c and G_s at different (than x_1, y_1) locations 64 [62]. The "filtering "operation for obtaining filtered responses thus involves moving the filters over the relevant area of the integration and obtaining for each pixel a function value. The value of R^*_{op} is in general different from that of R_{op}, except for the special case when both are calculated at the same (x, y).

Page 19, line 4:

B11

As can be understood from the subscripts "c" (center), "s" (surround), "do-c" (double-opponent center), "do-s" (double-opponentsurround) and "do-r" or "do-remote" (double-opponent remote), the various receptive fields ("RF") and spatial convolutions extend over different numbers of pixels. FIGS. 5 and 6 show two different schematic descriptions of double-opponent RFs which include the remote influences. FIG. 5 shows an on-center cell **100** with a center RF **102** (pixel A) and a surround RF **104** (pixels B). The on-center cell is surrounded by 8 [9] off-center cells cells **106**, each with a center RF **108** (pixel C) and a surround RF **110** (pixels D). Cell **100** and cells **106** are opponent cells, and together constitute a double-opponent ("do") cell **112**, on-center cell **100** constituting a "do-center" RF, and off-center cells **106** constituting a "do-surround" RF. Do-cell **112** has a do-remote RF **114**, which includes on-center opponent cell RFs **116**, each with a center RF **118** (pixel E) and a surround RF **120** (pixels F). For simplification purposes, only nine such RF **116** are shown in the upper right corner of do-remote RF **114**, with the understanding that they are repeated in the rest of the (unmarked) pixels. The different marking of pixels in cell **100** and RFs **116** indicates the different values resulting from the application of different spatial weight functions at those locations. In the example of FIG. 5, the different receptive fields extend over different areas: for both on-center and off-center opponent cells, the center RF includes one pixel, while the surround RF extends over the 8 pixels immediately surrounding each center. For double-opponent cell **112**, do-center RF **100** extends over 9 pixels and the do-surround RF (which includes the nine cells **106**) extends over the adjacent 72 pixels. Do-remote RF **114** extends over the 648 pixels surrounding do-cell **112**. It should be clear that the different areas over

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which the spatial weight functions are applied in the convolutions can also partially overlap, or be separated by gaps. For example, cells **116** [106] whose RFs compose the do-remote RF and who are used in computing the do-remote signal can partially overlap, or can be separated by gaps.

Please add in p. 13 a new figure caption as follows:

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FIG. 1 is a schematic cross section of a human retina;

FIG. 1a is a prior art schematic block diagram of a model of ganglion cell response;

FIG. 2 is a schematic description of on-center and off-center opponent receptive fields;

In the Figures:

Please add the referenced FIG. 1 of Dahari and Spitzer (mentioned on Page 11, line 17 of the specification) as FIG. 1a (prior art).

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In the Claims:

1. (Amended) A method for correcting the color contrast of a scene, the scene including an intensity spectrum at each of a plurality of pixels, the method comprising the steps of:

a) providing a red image, a green image, and a blue image, each image having a pixel value at each of the plurality of pixels;

b) computing a center red response, a center green response and a center blue response based on said images;